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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> :	A1	(11) International Publication Number: WO 99/46909 (43) International Publication Date: 16 September 1999 (16.09.99)
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(21) International Application Number:	PCT/SE99/00389	(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
(22) International Filing Date:	12 March 1999 (12.03.99)	
(30) Priority Data:	9800851-9 12 March 1998 (12.03.98) SE	
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Published		<i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments. In English translation (filed in Swedish).</i>

(54) Title: DEVICE FOR ENTERING SIGNS INTO A CELLULAR TELEPHONE

(57) Abstract

The invention concerns a device for character input in a mobile telephone. It is distinguished by replacing the set of buttons/keyboard by the signals from an accelerometer being decoded. The device is built into the mobile telephone, or sends signals via a line, or cordlessly, to the mobile telephone. Decoding into characters or commands takes place by means of algorithms for pattern recognition of the acceleration signals or their time integration. Movements that correspond to characters are distinguished from the movement pattern when contact with a writing surface is made.

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**DEVICE FOR ENTERING SIGNS INTO A CELLULAR TELEPHONE**

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**TECHNICAL FIELD**

The invention concerns a device for character input in a mobile telephone. It replaces a set of buttons or keyboard and, for example, makes it possible to reduce the size of mobile telephones.

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**BACKGROUND**

In mobile telephony it is becoming increasingly common to send text messages and E-mail. Coinciding with telephones becoming smaller, it is becoming increasingly difficult to make space for a text-input keyboard. The 20 invention in question provides the possibility of text input without a keyboard.

**SUMMARY OF THE INVENTION**

For the purpose described above, the invention provides a device for character input in a mobile telephone, in accordance with the following patent 25 claim.

The invention is thus based on the signals from an accelerometer being decoded and the characters being identified by means of algorithms for pattern recognition. The device is part of the mobile telephone or sends 30 signals to the mobile telephone via a line or cordlessly.

**DESCRIPTION OF PREFERRED EMBODIMENTS**

By fitting objects such as a mobile telephone or another tangible object with a 35 sensitive accelerometer, the accelerometer can be made to send signals when the object is used in the same way as a pen. When the signals are decoded, patterns in them can be linked to various characters or commands. In this way, a computer can be programmed to recognise the movement

- 5 patterns of various hand-written characters. In practice, this can then be employed in a mobile telephone, for example, in such a way that the entire telephone is used like a pen.

- To achieve the best possible degree of efficiency, the accelerometer should  
10 be located as far away as possible from the object's centre of gravity, such as in one of its corners or on the tip of a mobile telephone's antenna. When the object, e.g. the telephone, is then used like a "pen", the part of the telephone that contains the accelerometer can be held against the writing surface. This is because the tip of a pen is the part that moves the most when the pen is  
15 used for writing.

- The accelerometer can even be fitted into a separate object that could be similar to a pen in shape. Then the signals from the accelerometer, either before or after processing/interpretation/decoding to characters/commands,  
20 could be sent via a line or cordlessly to the telephone.

In accordance with the invention, the accelerometer can be uni-, di- or triaxial.

#### Basic principle for decoding signals

- 25 Decoding of the acceleration signals is based on pattern recognition. It is not necessary to integrate the signals so that the written characters are visible in order for them to be recognised. Character recognition can be performed either on the direct acceleration signals or following time integration of the position signals.

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#### Advantages

- Compared to decoding of speech, the decoding of hand movements means processing significantly (at least by a factor of ten) smaller quantities of information. To further limit the quantity of information that needs to be  
35 processed, higher and lower frequencies can be filtered out when the accelerations that are generated by normal handwriting fall within a fairly narrow frequency range.

5 Discernment of character sequences within the movement pattern

The device must be able to discern movements that correspond to a character or a command from the movements to which it is subjected. First, it must be able to identify the start and end of a character. The following methods can be used to decide which parts of a movement pattern should be decoded.

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Contact with the surface, contact sensor or pressure sensor

A pressure sensor or contact sensor in the tip of the device signals when the device comes into contact with the (writing) surface. From this point on the acceleration signals are decoded on the horizontal plane until the device is 15 lifted from the surface, i.e. the contact sensor signals that contact with the surface has been broken.

Surface contact - acceleration pattern

When the device is brought into contact with the surface, powerful 20 acceleration at right angles to the surface arises. If a triaxial accelerometer is used, this signal can be used to identify the start of the characters/commands. From this juncture, the acceleration signals are decoded on the horizontal plane until the device is lifted from the surface, which is recognised by the resulting acceleration that arises when the pen is lifted from the surface.

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Surface contact - vibration patterns

If the device is used on an uneven surface, such as paper, the vibrations that arise during the writing process are detected by means of the accelerometer and used as a signal that contact with the surface is taking place.

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Movement to the left

If all the characters are written on the same spot, the device must be moved back between two characters. This movement, in conjunction with a downward movement, could be used to mark the start of a character. In the 35 same way, a movement upwards could be used to recognise the end of a character.

5 Discernment of commands from within the movement pattern

It is also possible to allow movements, other than those that correspond to written characters, to match various commands. For example, movements in three dimensions can be used for this. The command movements are essentially recognised in the same way as characters, i.e. by means of  
10 algorithms for pattern recognition.

Other uses

The device can also be used to recognise people's initials or signatures. By decoding and registering the acceleration pattern, it will in practice be  
15 impossible to forge signatures. The principle described for decoding handwriting movement patterns, interpreted by means of an accelerometer, can also be used for character input in a computer. The advantages of this are evident, such as when the computer is so small there is no space for a keyboard; or for people who have difficulties in using a normal keyboard.

## PATENT CLAIMS

- 10 1. Device for character input in a mobile telephone, **characterized by** it containing an accelerometer, which is designed to decode the character input movements when the device is used like a pen.
- 15 2. Device for character input in a mobile telephone, **characterized by** an accelerometer being located in a separate object, which, before or after processing, interpretation or decoding, is designed to send signals to a telephone, either via a line or cordlessly.
- 20 3. Device in accordance with either of the above patent claims, **characterized by** an accelerometer being located at the greatest possible distance from the centre of gravity of the device, such as in the tip of the mobile telephone's antenna.
- 25 4. Device in accordance with any of the above patent claims, **characterized by** the accelerometer being uni-, bi- or triaxial.
- 30 5. Device in accordance with any of the above patent claims, **characterized by**, when the accelerometer is triaxial, its sensor being induced to monitor the movements against the surface and analyse them on the horizontal plane.
- 35 6. Device in accordance with any of the above patent claims, **distinguished by** character recognition being based on the acceleration signals, their first time integral, their second time integral, or a combination of these.
- 35 7. Device in accordance with any of the above patent claims, **characterized by** the amount of information being limited by means of filtering out high and/or low frequencies in the acceleration signals.

- 5    8. Device in accordance with any of the above patent claims, **characterized by the start and end of a written character being recognised by a contact or pressure sensor detecting that the object is in contact with the writing surface.**
- 10    9. Device in accordance with any of the above patent claims, **characterized by the start and end of the written character being recognised by the acceleration pattern that arises when the object is brought into contact with, or is lifted from, the writing surface.**
- 15    10. Device in accordance with any of the above patent claims, **characterized by the start and end of the written character being recognised by the vibration pattern that arises when the object is moved against an uneven writing surface, such as paper.**
- 20    11. Device in accordance with any of the above patent claims, **characterized by certain movement patterns corresponding to commands.**
12. Use of the device in a mobile telephone in accordance with any or some of the above patent claims.

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 99/00389

## A. CLASSIFICATION OF SUBJECT MATTER

**IPC6: H04M 1/00, G06F 3/03, G06K 11/18**

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

**IPC6: G06K, H04M**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

**SE,DK,FI,NO classes as above**

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**WPI**

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 9409447 A1 (ORBACH, ZVI ET AL), 28 April 1994 (28.04.94), page 7, line 12 - page 12, line 27, figures 1-6B, abstract  --	1-12
Y	WO 9716799 A2 (BARON TECHNOLOGIES LTD.), 9 May 1997 (09.05.97), page 8, line 22 - page 15, line 7, figures 1,4, abstract  --	1-12
Y	EP 0439340 A2 (NEC CORPORATION), 31 July 1991 (31.07.91), column 1, line 4 - column 6, line 12, figures 1-5C, abstract  --	1-12

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents	"I"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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**9 June 1999**

Date of mailing of the international search report

**05 -07- 1999**

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 99/00389

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	WO 9521436 A1 (BARON MOTION COMMUNICATIONS, INC. ET AL), 10 August 1995 (10.08.95), page 2, line 1 - page 22, line 17, figures 1-8B, abstract  --	1-12
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Y	EP 0615209 A2 (KABUSHIKI KAISHA TOSHIBA), 14 Sept 1994 (14.09.94), figure 8, abstract  -- -----	1-12

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

03/05/99

International application No.

PCT/SE 99/00389

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